of many rapidly succeeding impressions, then tints are graded into one another at the edges, and we lose the power of distinguishing detail.

I can give, fortunately, a case in point. My eyes are affected with a small amount of astigmatism. It does not affect general vision for ordinary purposes, nor, of course, the definition of single lines; but, when I use appropriate lenses, the whole scene becomes brighter and more cheerful, and I see details. The bark of a tree is a perfectly different object with and without them. With them it is like a good photograph; without them, like many pictures. Formerly, in addition to the cylindrical surface, I required a slight spherical concave, and I was disposed to place the increased general brilliancy of the view mainly to the reduction of size, but I now use plano-cylindrical lenses for distant vision, and it is evident that the brilliancy is solely due to the better definition.

I would, lastly, suggest for Lord Rayleigh's consideration the question whether the change of focus of his eyes in faint light is not partly, at all events, due to change in the colour of the light. I know that there is such a change with me, but I have long had reason to believe that colour affects my vision.

J. F. TENNANT

37, Hamilton Road, Ealing, W., February 7

THOSE who have compared Lord Rayleigh's letter in NATURE of February 12 with that of Mr. Brudenell Carter on February 26 will have observed an inconsistency occasioned by a slip of the pen.

The latter says: "The commonly accepted standard of normal vision is satisfied by deciphering letters the parts of which subtend visual angles of one minute. . . ." Also, Prof. McKendrick states that "The smallest visual angle in which two distinct points may be observed is 60 seconds."

According to Lord Rayleigh, however, "A double star cannot be fairly resolved unless its components subtend an angle exceeding that subtended by the wave-length of light at a distance equal to the aperture. If we take the aperture of the eye as 1/5th inch, and the wave-length of light as 1/40,000th inch, this angle is found to be about two minutes." In the case of a small angle the aperture divided by the distance is approximately equal to the arc divided by the radius or to the circular measure of the angle. Hence in the present case we have $\frac{1/40{,}000\text{th inch}}{1/5\text{th inch}} = \frac{1}{8000}$ radian or $\frac{206{,}265}{8000} = 25{\cdot}8$ seconds nearly, instead of the two minutes accidentally stated by Lord Rayleigh.

This minimum value seems to show some mistake in Ehrenberg's experiments on vision, and is about half of that found by Helmholtz for the best of twelve observers.

March 10 SYDNEY LUPTON

[Mr. Lupton is quite right. By a stupid blunder I said about two minutes, when I should have said about half a minute.—RAYLEIGH.]

THERE is a defect of eyesight common among the natives of India known as "rátandhí," *lit.* "night blindness." Persons affected with this have either ordinary powers of vision by daylight, or else powers so little less than ordinary as to feel no inconvenience, so that usually no defect is noticeable; whilst in feeble twilight their sight fails in the most extraordinary way, and in the dusk they become (in bad cases) practically blind. Of course there are all degrees of this affection; but the strongly-marked cases alone are likely to attract attention.

By medical men in India this affection is said to occur most among men living on a low diet (chiefly of cereals), and the usual palliative treatment is to prescribe a meat diet.

This affection is rarely noticeable among Europeans in India, though I have sometimes noticed marked differences of clearness of sight among them also amounting to slight "night-blindness." Lord Rayleigh's case of short-sightedness in twilight and in the dusk seems to be a mild case of this sort (see NATURE, February 12, p. 340). ALLAN CUNNINGHAM

The Pupil of the Eyes during Emotion

ALTHOUGH further observations are required, there seems to be a more or less general assent as to the influence of the emotions on the pupils of the eyes. Mr. Clark, in his letter to your journal (vol. xxxi. p. 433), has rightly quoted Gratiolet, who says that in sudden astonishment or fear the whole system becomes paralysed, and at the same time the pupils dilated. In anger, on the other hand, when the whole body is roused into action, the pupils become contracted: "Les pupilles sont énormément dilatées dans l'épouvanté, tandis qu'elles sont toujours contractées dans le colère." This was, however, said many years before by the celebrated Harvey, who, in his discourse on the circulation of the blood, written in 1628, says: "In anger the eyes are fiery, and the pupils contracted" ("Irâ rubent oculi, constringitur pupilla").

I should myself think that a narrow pupil evinces a more active mental state, as it is this condition which is present when the eye is accommodated to regard with attention a near object, whilst, on the other hand, when gazing out into distance, the pupils are wider, and the mental mood is more passive and contemplative.

In my parrot the size of the pupil is a very excellent measure of its frame of mind. When angry the pupil becomes minutely contracted, whereas when the bird is sympathetic and amiable the pupils become as widely dilated. Balzac, with other novelists, have depicted the state of the pupils when describing the various emotions and passions. The former in pourtraying a saintly woman kneeling before the altar, says: "The pupil of the eye, endued with great contractility, appeared then to expand and draw back the blue of the iris until it formed no more than a narrow circle. What force was that arising in the depths of the soul which so enlarged the pupils in full daylight and obscured the azure of those celestial eyes?" Darwin speaks doubtfully, but rightly demands more observations on the subject. SAMUEL WILKS

Grosvenor Street, March

Auroræ

AFTER a long and remarkable absence of aurora, which, from a letter in your columns of February 19 (p. 360) does not appear to have been confined to these more southerly latitudes, we were favoured last evening with a beautiful, though somewhat transient display. It was about 9·25 p.m. when I first noticed a long band or belt of light above the northern horizon. At first it was ill-defined, with little change of position, but in about twenty minutes it became more luminous and the characteristic streamers suddenly made their appearance, shooting upwards, sometimes from above, sometimes from below the belt of light, which for a few seconds changed into a double arch. Some of these streamers rose as distinct columns, showing the usual prismatic hues, one in particular being noticeable as traversing the inverted W of Cassiopeia, another forming a fan-like terminus to the luminous region, but all confined to a low altitude, bounded on the north-west by Perseus, and on the north-east by Vega, then rising. It may be well to observe that on the same day (the 15th) a large sun-spot had just reached the central meridian, and was beginning to show signs of great disturbance. E. BROWN

Further Barton, Cirencester, March 16

Injuries caused by Lightning in Venezuela

IN answer to Mr. von Danckelman's inquiry as to the use of lightning-rods and the frequency of accidents from lightning in the tropics (NATURE, December 11, 1884, p. 127), I beg leave to offer the following information referring to Venezuela, where I have been residing ever since 1862:—

Thunderstorms are very frequent during the rainy season. They break out generally in the afternoon, about the time of the daily maximum of heat, whilst they are extremely rare in the morning (I only witnessed one case) and during the night. Statistics of accidents do not exist, nor are there many lightning-rods in use (in Caracas about half a dozen). But there are certain regions where the former are far from being uncommon, as, for instance, the country around the Lake of Valencia and the plains or *llanos* to the north of the Orinoco. In these a considerable number of cattle are killed by lightning every year, and I know also of several cases where houses were destroyed and people killed. The herds of cattle crowd together as soon as a thunderstorm begins, and the animals remain during the whole time with their heads down to the ground, thus avoiding instinctively that their pointed horns should act as lightning-conductors.

In the neighbourhood of Maracay, at the eastern end of the Lake of Valencia, accidents occur almost every year. A very

remarkable one was witnessed in 1883 by Dr. Manuel A. Diez, at that time physician of the military camp at Maracay. A lightning struck a *rancho* (small country house built of wood and mud, and thatched with straw or large leaves), where a man slept in a hammock, another lay under the hammock on the ground, and three women were busy about the floor ; there were also several hens and a pig. The man in the hammock did not receive any injury whatever, whilst the other four persons and the animals were killed. As the wooden framework of the house was probably very dry, the man in the hammock was almost isolated ; but the other persons and the animals were in direct contact with the floor—in this case the bare ground.

Near Caracas accidents are comparatively rare. During all the years of my residence here no more than six have come to my knowledge : in three of them some damage was done to buildings, in two cases large trees were split, and in one (October, 1882) a ploughman was killed while at work in the field, together with his two oxen, his driving-stick (about four yards long, and shod with an iron point) having acted as lightning-conductor. A. ERNST

Caracas, February 8

Mira Ceti

WITH reference to your note on Mira Ceti in NATURE of February 5, I beg to say that I have observed Mira since December 15, 1884, and my observations show that the star reached a maximum on February 4, when I estimated it equal to α Ceti, or about 2·7 magnitude. It remained of the same brightness up to February 13, and has faded very slowly since that date. It was, last night, not much below α Ceti.

J. E. GORE

Ballysodare, Co. Sligo, Ireland, March 8

Physical Geography of the Malayan Peninsula

I HOPE you will give me space in your journal to correct a few errors that have slipped into the letter under this heading in the issue of December 18 (p. 152) by the Rev. J. E. Tenison-Woods.

In the first place, there is no fluor-spar in the drift which carries the tin. The stone referred to is rose-quartz, some of which is very beautifully coloured. I have a specimen of it nearly as large as a man's head. It has a specific gravity of 2·63, and hardness equal to ordinary white quartz, which it will scratch without difficulty.

In the next paragraph Mr. Tenison-Woods says he cannot recall any mines on the eastern slopes of the mountains. This seems extraordinary, as some of the best mines in Kinta are on the eastern slopes of the valley, and I accompanied Mr. Tenison-Woods to the Lehat, Pasin, and Papan mining districts, and, with the exception of the Kwala, Diepang, and Gopeng mines, these were the only ones visited by him in Kinta, which were not on the eastern slopes of the valley. Following out the same idea, he says, speaking of the Kinta valley, "The river flows, like the Perak, on the eastern side of the valley." This is also a mistake, for it is decidedly on the western side, and this accounts for the fact mentioned in the next line : "The eastern tributaries are many and important." If the rivers were as stated by the rev. gentleman, this would be nearly impossible. I have taken the opportunity of asking the opinion of the officer in charge of the Kinta district, and he coincides with my view of the position of the river.

The next point on which I cannot agree is that "there is not the slightest sign of any recent upheaval of the coast-line, while the evidence of subsidence is equally absent. A short time ago a boring was made to a depth of 75 feet at Matang (which is the port of Larut), and I made a section from it, which shows that, within quite recent times, an important alteration of level has taken place. The ground at that place is 6 feet above the present high-water mark. Down to a depth of 17 feet from the surface the formation is marine, but below that, beds of sands, clays, and gravels, with leaf-bands and pieces of wood, are met with, of the same nature as the drift near the hills, and containing a small quantity of fine tin ; these beds extend down to a depth of 75 feet, and most probably much further. It therefore appears that there has been a subsidence of at least 75 feet since the formation of the tin-bearing drift of Larut. An alteration of level of this extent must have made most important geographical changes in the Straits of Malacca, and may help to solve many of the problems connected with the distribution of the flora and fauna of this interesting locality.

The limestone-hill on the eastern side of the Gapis Pass, called Gunong Pondok, is 1800 feet in height, instead of 400 feet, as stated ; and is connected by a ridge with the main range of mountains. A little further on Mr. Tenison-Woods says that there are *two* mountains called Gunong Hijau. This is a very excusable mistake for a stranger to make, for one is Hijau, which means "green," and the one further to the north is Ijoh, which is the name of a palm (*Arenga saccharifera*). The Kurau river has its source on the former mountain, at the back of the town of Thaipeng. About four years ago I followed the stream from near the summit of Hijau down to the plains.

L. WRAY, Jun.

Perak Museum, Larut, Perak, January 30

The Continuity of Protoplasm in Plant Tissue

THERE is some danger that those who are unable to make a personal examination of the Florideæ may be a little misled by Mr. Gardiner's remarks thereon in his article on "The Continuity of the Protoplasm in Plant Tissue" (NATURE, vol. xxxi. p. 390). In arguing in support of his own view that this continuity is not direct, but indirect he states that "Schmitz has found that a pit-closing membrane," "perforated in a sieve-like manner," exists in the Florideæ, and that he himself has "been able to confirm Schmitz's results as to the existence of the closing membrane in question."

Now, if Mr. Gardiner means by this that what he terms a pit-closing membrane, perforated in a sieve-like manner, is present in *all* the Florideæ, or even in *all parts* of the thallus of a single species, I venture to submit that the statement is not in strict accordance with fact. In my investigations into the histology of these plants, special attention was paid to this point, and by no methods that I could devise, or learn from other workers, was such a membrane to be demonstrated in the simpler forms, as, for example, in *Petrocelis cruenta*. Indeed, I cannot conceive how a sieve-plate arrangement could possibly exist, where the continuity is maintained by *a single thread of protoplasm*, and that of such extreme tenuity as in the species referred to. So far as I am aware, no one maintains the existence of a sieve-plate in the threads of Volvox, and I fail to see why it should be assumed to exist in the equally fine threads now under consideration.

Further, in *Polysiphonia*, *Ptilota*, and other genera, where a membrane is normally present, it is *not* met with *in every part* of the thallus, being absent from the younger portions. In these portions the connecting threads are *single* and *extremely delicate*, so that while observation affords no indication of a sieve-plate, the arrangements themselves preclude the possibility of one. As the threads grow older and thicker, a membrane which may be perforated is developed, but it is no part of the primary wall of the protoplast. Thus, while the connecting protoplasmic threads exist from the first, the so-called pit-closing membrane arises as *a later development*, and is therefore *subsidiary to the continuity*, and *not essential* to it.

So far, then, as the Florideæ are concerned, I think we must recognise two conditions or stages of continuity ; first, a direct continuity, permanent in the simpler forms, but transitory in the more complex ones ; and second, an indirect continuity, absent from the younger, but present in the older tissues.

Harrogate, March 7 THOMAS HICK

Time in the United States

IN your issue of January 23 the statement (p. 277) that "local time throughout the United States, as opposed to railway time, has been abolished," is not quite accurate. At the introduction of the "standard" time an attempt was made in many places to do this, but it has proved impracticable, except near the meridians of time. At other places the local time still governs all the daily business, except what involves travelling. For this the difference, a constant quantity, is remembered, and the proper allowance made. For example, here we allow thirty-three minutes, being west of the meridian of eastern time to that amount. E. W. CLAYPOLE

Akron, Ohio